

## Risk factors associated with HCV infection among adults in Damietta Governorate, Egypt

A Case control study of risk factors associated with HCV

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### Abstract

**Aim:** Hepatitis C virus (HCV) is a major cause of cirrhosis, liver cancer, and mortality worldwide. Egypt has the highest burden of Hepatitis C in the world. HCV prevalence is directly related to the prevalence of persons who routinely share injection equipment and to the prevalence of unsafe parenteral practices in healthcare settings. The study aimed to identify risk factors associated with HCV infection among adults.

**Material and Methods:** This case control study nested from a household survey that was conducted to screen for hepatitis B virus and hepatitis C virus was conducted in Damietta Governorate, Egypt. One hundred-fifty cases and controls were randomly selected from those showed positive HCV (278) and 300 controls were randomly selected from those showed negative HCV (2699).

**Results:** Participants were aged between 20 and 67 years (mean 42.0 +10.6 years). The study revealed a significant difference between case and control group regarding age, residence, education level and marital status ( $P = 0.001$ ). Case-patients were more likely than controls to have exposure to dental procedure, previous stitches, surgical operation schistosomiasis injection treatment, blood transfusion and intravenous(IV) fluid intake were significantly associated with HCV infection ( $P < 0.05$ ). Also, unsafe community practices (cupping, acupuncture, shared shaving razor, traditional cauterization, needle or sharp stick and tattooing) were significantly different between HCV-infected patients and controls ( $P < 0.01$ ).

In multivariable analysis, marital status and rural residence and history of stitches, intravenous fluid, dental procedure, renal dialysis, sharing shaving razor, acupuncture, needle or sharp stick and cupping were associated with higher odds of having HCV.

**Discussion:** The results of this study showed that exposure to unsafe medical procedures and social practices were risk factors for HCV infection. Promotion of infection control programs in healthcare settings and health education campaigns to increase the awareness and empowerment of the community are strongly recommended.

### Keywords

Risk factors; Case; Control; HCV; Infection; Egypt

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## Introduction

Hepatitis C virus (HCV) infection is a major health problem. It is a liver infection caused by a blood-borne hepatitis C virus (HCV). World Health Organization ("Hepatitis C: fact sheet no. 164. (2017)) reported that 1.75 million new hepatitis C virus (HCV) infections occurred worldwide in 2015, with the highest incidence in the European Region and the Eastern Mediterranean Region.

About 55-85% of HVC infected persons develop chronic infection. About 5-20% of those chronically infected will develop cirrhosis within 20-30 years, and 1% to 5% die from consequences of chronic infection (cirrhosis and hepatocellular carcinoma) [1].

Viral hepatitis is the seventh leading cause of mortality globally. A third of this mortality is attributed to hepatitis C virus (HCV). In the Middle East and North Africa, HCV accounts for two-thirds of viral hepatitis mortality and disability-adjusted life years [2, 3].

World Health Organization ("Hepatitis C: fact sheet no. 164. (2017)) reported that approximately 71 million persons were living with chronic HCV infection in the world, accounting for 1% of the population. The prevalence of HCV infection is more heterogeneously distributed, with differences across and within WHO regions and countries. Spread through breaks in infection control practices or injection drug use may explain this pattern. The highest was in the Eastern Mediterranean Region (2.3%) followed by the European Region (1.5%).

Central Asia and Central Africa are estimated to have high prevalence (> 3.5%); East, South and Southeast Asia, West and East Africa, North Africa and the Middle East, Southern and Tropical Latin America, Caribbean, Australasia, and Eastern Europe are estimated to have moderate prevalence (1.5%-3.5%); whereas Southern Africa, North America, Andean and Central Latin America, Pacific Asia and Western and Central Europe have low prevalence (< 1.5%) [4]. Globally, 80% of all HCV infections occur in 31 countries, with six countries (China, Pakistan, Nigeria, Egypt, India, and Russia) accounting for greater than 50% of all infections [5].

The prevalence of Hepatitis C virus in Egypt is about 10 -15%, which is considered the highest in the world. Genotype 4 represents 93 % of Egyptian HCV infections [6-8]. A cross-sectional survey of 21 governorates in Egypt (included 12169 adult persons) showed that overall anti-HCV seroprevalence was 14.8% [9]. High prevalence among Egyptian attributed to previously extensive intramuscular anti-schistosomal treatment campaigns during the second half of the twentieth century [10]. Evidence of ongoing transmission was reported that might be due to infection control or behavioral issues [11].

Hepatitis C virus (HCV) is transmitted through contact with blood of an infected person, unsafe injections or other invasive medical and non-medical practices (such as tattooing or piercing) when the skin is damaged, sharing of personal items such as razors and toothbrushes, and accidental needle-stick exposures among healthcare workers; and, where blood safety measures are suboptimal, via transfusion of unscreened blood and blood products [12].

World Health Organization (Hepatitis C in the WHO European Region Fact sheet, 2019) revealed that Hepatitis C is curable

and the new antiviral medicines can cure more than 95% of people, reducing the risk of complications and death but access to diagnosis and treatment is low. There is no vaccine for hepatitis C. Prevention should, therefore, be focused on reducing the risk of exposure to the virus.

The aim of this study was to identify risk factors associated with HCV infection among adults.

## Material and Methods

### Study design

This case-control study derived from a household survey that was conducted to screen for hepatitis B virus and hepatitis C virus in the period from December 2011 to September 2012 in Damietta Governorate, located in the north Nile Delta area, Egypt, using multistage random sampling, 3 districts out of 5 districts were chosen randomly. Then 1 village or city (as a cluster) was chosen from each district. Thus, the sample consisted of 3 villages and 3 cities representing the 5 districts in these selected areas, one in every three houses was chosen. All residents aged 20 or older years accepted to share in the survey were included. The sample size was determined using Epi info, version 7.1.5, 2015. One hundred fifty cases and controls were randomly selected from those who showed positive HCV (278) and 300 controls were randomly selected from those who showed negative HCV (2699).

The ethical issue was considered and the survey was approved by the institutional review board of Al-Azhar University. All subjects included in the survey gave their consent to participate in the research; they were informed that all collected data will be used for scientific purposes only.

### Data collection

The data were collected by an interview questionnaire which included sociodemographic data (age, sex, residence, marital status, education, and occupation); risk factors (history of previous exposure to surgical operations, dental procedures, stitches, intravenous drugs, blood transfusion, schistosomiasis injection treatment, needle stick, endoscopic examination, or renal dialysis); and risky behaviors such as sharing shaving razors, traditional cauterization, acupuncture, cupping (hijama) and tattooing.

### Viral serology

Venous sampling (5 ml) was collected and allowed to clot. Serum was separated and kept frozen at -20 °C until assay. ELISA kits (Fortress Diagnostic Ltd) was used to estimate anti-HCV.

### Statistical Analysis

Data were analyzed using SPSS software, version 16.0 (SPSS Inc. Chicago, USA) Univariate analysis was used to compare variables for the outcomes of interest. Continuous data (age) were compared using the Student's t-test. Either x<sup>2</sup> or the Fisher's exact tests were used to compare categorical variables. A multivariate analysis was also performed using multiple logistic regressions. All p-values lower than 0.05 were considered statistically significant with a 95% confidence interval.

## Results

Total of 450 patients aged 20 to 67 years were included in this study, 150 as cases (positive for HCV) and 300 patients

**Table 1.** Comparison of socio-demographic characteristics between cases and controls

Risk factors	Case		Control		Odds ratio (OR)	P-value
	N=150	%	N=300	%		
Age	44.9±9.8		40.8±10.7			0.001
20- 49 years	67	45.0	179	60.0	1.2	0.03
50 years or above	83	55.0	121	40.0		
Gender						
male	72	48.0	168	56.0	0.7	0.1
female	78	52	132	44		
Level of education						
below Secondary education	112	74.7	166	55.3	2.4	0.001
Secondary education and higher	38	25.3	134	44.7		
Residence						
Rural	103	68.7	122	40.7	2.1	0.001
urban	47	31.3	178	59.3		
Marital status						
Ever married	107	71.3	111	37.0	2.8	0.001
never married	43	28.7	189	63.0		
Occupation						
Non Worker or employee	83	55.3	138	46.0	1.5	0.06
Worker or employee	67	44.7	162	54.0		

**Table 2.** Comparison of risk factors between cases and controls

Risk factors	Case		Control		Odds ratio (OR)	P-value
	N=150	%	N=300	%		
Dental procedure	96	64.0	134	44.7	2.2	0.001
Previous stitches	86	57.3	129	43.0	18	0.004
Major Surgical operation	73	48.7	83	27.7	2.5	0.001
Schistosomiasis injection treatment	60	40.0	90	30.0	1.6	0.03
Renal dialysis	18	12.0	27	9.0	1.4	0.3
Iv drugs	70	47.3	160	53.3	0.8	0.2
Blood transfusion	23	15	27	9.0	1.8	0.04
Iv fluid	122	81	127	42	5.9	0.001
Endoscopic examination	42	28	80	27	1.1	0.8
cupping	106	71	121	40	3.6	0.001
Acupuncture	93	62	89	30	3.9	0.001
Shared shaving razor	126	84	115	38	8.4	0.001
Traditional Cauterization	88	59	139	46	1.6	0.01
needle-or sharp stick	110	73	97	32	5.8	0.001
Tattooing	87	58	89	30	3.3	0.001

as controls (negative for HCV). Regarding socio-demographic characteristics of the study groups, Table 1 reveals a highly significant difference between case and control group regarding age, residence, education level, and marital status (p = 0.001). Table 2 shows a history of dental procedure, previous stitches, surgical operation schistosomiasis injection treatment, blood transfusion and intravenous (IV) fluid intake were significantly associated with HCV infection (p< 0.001). Also, unsafe community practices (cupping, acupuncture, shared shaving

**Table 3.** Multivariable analysis, factors independently associated with hepatitis C infection

	B	P-value	Adjusted OR	95 CI
Stitches or minor surgeries	1.7	0.001	5.2	2.5 – 10.8
Razor sharing	1.6	0.001	4.8	2.0-11.5
Intravenous fluid	1.3	0.001	3.7	1.8 -7.4
Residence	1.3	0.001	3.6	1.9 – 6.5
Acupuncture	1.2	0.001	3.4	1.6- 7.1
Needle or sharp stick	1.2	0.003	3.2	1.5 – 6.8
Marital status	1.0	0.001	2.7	1.5 -5.0
Renal dialysis	0.95	0.04	2.6	1.1 – 6.5
Cupping	0.8	0.02	2.3	1.1-4.5
Dental procedure	0.7	0.04	1.9	1.1 -3.4

razor, traditional cauterization, needle or sharp stick and tattooing) were significantly different between HCV-infected patients and controls (p < 0.01).

Table 3 shows the multivariable analysis, two socioeconomic factors (marital status and residence) were associated with higher odds of having HCV (OR =2.7, CI = 1.5 -5.0; OR =3.6, CI = 1.9 – 6.5 respectively). Regarding health care practices, patients with history of stitches or minor surgeries, intravenous fluid, dental procedure and renal dialysis were more likely to have HCV infection (OR =5.2, CI = 2.5 – 10.8; OR =3.7, CI = 1.8 -7.4; OR =1.9, CI = 1.1 -3.4; OR =2.6, CI = 1.1 – 6.5 respectively), compared with those without this history. Also four unsafe practices in the community (razor sharing, acupuncture, needle or sharp stick and cupping) were more likely to cause HCV infection (OR =4.8, CI = 2.0-11.5; OR =3.4, CI = 1.6- 7.1; OR =3.2, CI = 1.5-6.8; OR =2.3, CI = 1.1- 4.5 respectively).

**Discussion**

Hepatitis C virus (HCV) infection is a major cause of cirrhosis, liver cancer, and mortality worldwide. HCV seroprevalence is at up to 40% in some areas of Egypt [13]. Prevalence of HCV infection is directly related to the prevalence of persons who routinely share injection equipment and to the prevalence of unsafe parenteral practices in healthcare settings [1]. Reducing disease prevalence in any country requires not only enhanced rates of diagnosis and treatment but also strategies to prevent new infections.

Regarding sociodemographic factors, age, residence, education level, and marital status were significant risk factors for HCV infection that is similar to the results of different studies [14-16]. On the other hand, a study [17] in Egypt showed no association between age and HCV infection.

In this study, we observed that several unsafe invasive procedures such as dental procedure, previous stitches, surgical operation, schistosomiasis injection treatment, blood transfusion and [IV] fluid intake were significantly associated with a risk of HCV infections that is similar to the results of different studies [18-20].

The risk of HCV infection is significantly associated with unsafe practices in the community such as cupping, acupuncture, traditional cauterization, needle or sharp stick and tattooing and sharing shaving razors at community barbers which is

consistent with other studies [21,22].

Residence, marital status, dental procedure, stitches, intravenous fluid, cupping, acupuncture, sharing shaving razor and needle or sharp object stick, were significant predictive risk factors for HCV infection in the multivariate logistic analysis. This results are supported by other studies [23,24].

### Limitations

First, the study used a case-control design and data on the exposure were collected retrospectively, so recall bias is unavoidable. Secondly, the sample was not representative of all the Egyptian population as it was conducted in one governorate only

### Conclusion

The results of this study showed that exposure to unsafe medical procedures and social practices were risk factors for HCV infection in Egypt.

### Recommendations

Due to limited resources, activities to prevent the transmission HCV should focus on:

- Safe practices in the healthcare setting through expansion and promotion of infection control program.
- Health education campaigns, to increase the awareness of the community about the dangers of unsafe medical practices and empowering them to refuse unsafe medical practices.

### Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

### Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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### Conflict of interest

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